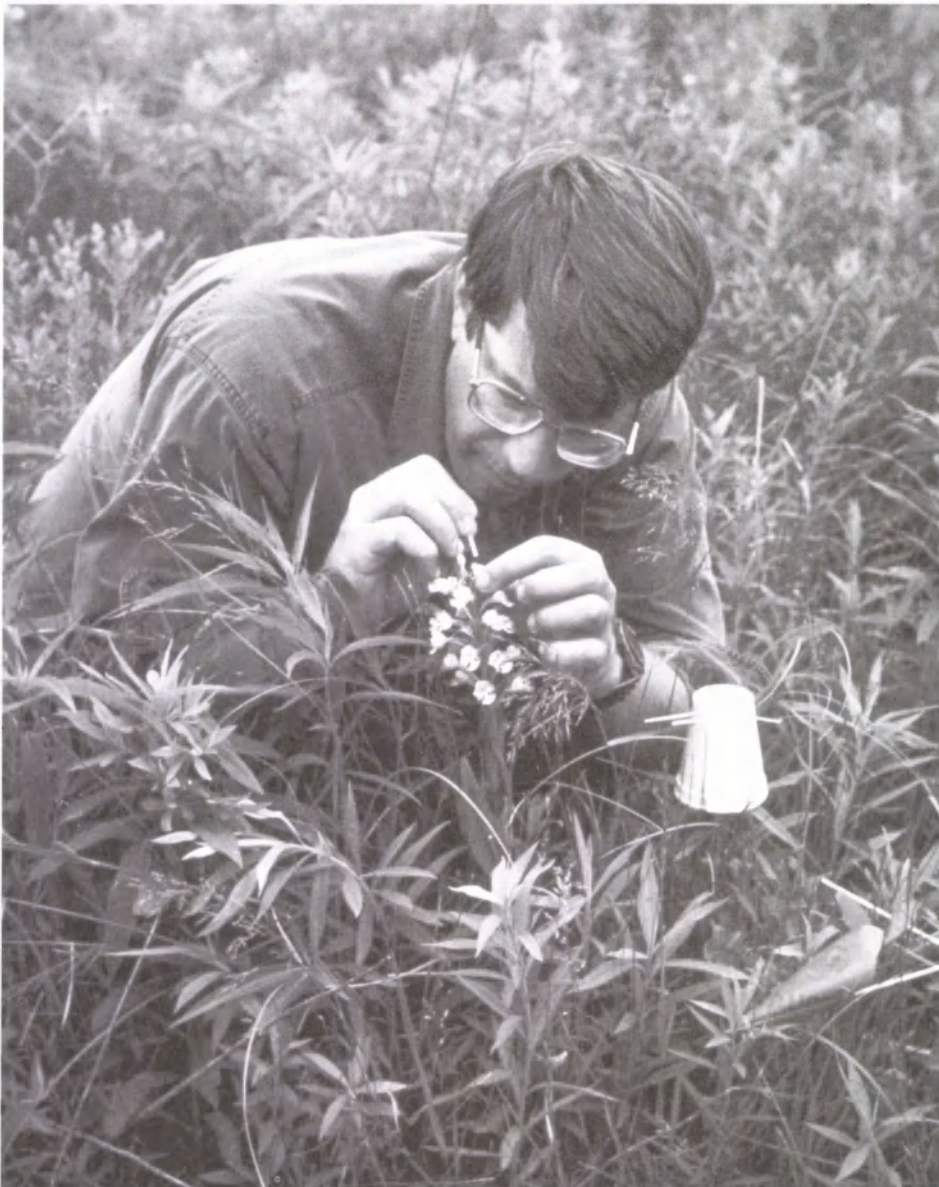


ENDANGERED *Species* BULLETIN

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The recovery of endangered and threatened plants and animals is all too often a difficult and lengthy process, but public/private partnerships are yielding some promising results. Some of these efforts involve the restoration of unique ecological features, such as California's "hogwallow" habitats. In other cases, habitat management techniques such as prescribed burning are used to maintain savanna ecosystems. Innovative uses of technology can also contribute to recovery. For example, radar and night-vision equipment are assisting researchers in the study of night-flying birds. Finally, intensive measures such as hand-pollinating endangered plants are necessary when natural pollinators disappear. Illustrations of these and other recovery strategies follow in this edition of the Bulletin.



U.S. Fish & Wildlife Service

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On the Cover

After natural pollinators disappeared from some eastern prairie fringed orchid sites, scientists and volunteers stepped in to hand-pollinate this threatened wildflower. At left, John Rogner, chief of the FWS Chicago Field Office, demonstrates this technique.

FWS photo

The *Endangered Species Bulletin* welcomes manuscripts on a wide range of topics related to endangered species. We are particularly interested in news about recovery, habitat conservation plans, and cooperative ventures. Please contact the Editor before preparing a manuscript. We cannot guarantee publication.

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Giving Orchids a Helping Hand



**Eastern prairie fringed
orchid**

Photo by John Schwegman

The eastern prairie fringed orchid (*Platanthera leucophaea*), one of the upper Midwest's most beautiful wildflowers, was once widespread in the region's prairies and wetlands. But like too many native plants, it is now rare and in danger of extinction, primarily due to the loss or alteration of its habitat. After botanists discovered that the orchid does not necessarily thrive even in protected habitat, they began to take the plant's pollination into their own hands, literally.

The inspiration for this unusual recovery strategy was conceived in 1981, when volunteers noted that orchids at a certain well-monitored location in Illinois were not setting seeds. They came to the conclusion that the species' natural pollinators, hawk moths of the family *Sphingidae*, were not visiting the orchids at this site. Steve Packard, using methods learned from Marlin Bowles of the Morton Arboretum, decided to try hand-pollinating this population. Later, Packard collected seeds and dispersed them at three sites in Cook County. Five years later, the first few orchids appeared on one site. In 1987, an orchid emerged on the second site, and in 1993, one plant appeared on the third site. Meanwhile, at the original or "donor" site, only one orchid has appeared in the past 10 years.

Following these efforts, a formal restoration project was initiated by The Nature Conservancy, acting in partnership with the Fish and Wildlife Service. It is guided by the draft recovery plan, which was written by Marlin Bowles. The project has two main objectives: 1) restoration of populations; and 2) management of habitat.

A key element in the recovery project is the need for volunteers. After workers are recruited and instructed in the art of hand-pollination, they are assigned to sites with existing populations and asked to take an accurate census of the orchids at their sites. For the majority of volunteers, these training and census-taking sessions provide their first glimpse of this stunning orchid. Volunteers are the manpower for the vast majority of field work for this project, and have provided dependable data for the past four years.

To meet the objective of restoring populations, orchids were hand-pollinated for three consecutive years. At some sites, this involved only a few orchids, while at others dozens were hand-pollinated. Seed capsules were collected in the fall for dispersal. During the 1993-1995 field seasons, seeds were dispersed to 28 sites in Illinois. These sites included locations with current orchid populations, sites with an historic record of populations but no current record, and sites that had no record of orchids but had appropriate habitat.

The most exciting news from the recovery project thus far comes from Kane County. Only one small popula-

tion of orchids existed in the county, but four others with proper habitat and good potential for establishing additional populations sites were located. Beginning in 1993, volunteers have dispersed seeds at these four sites. Last summer, three orchids were found blooming on a site where seeds had been hand sowed. Conventional wisdom states that it takes 5 years for the orchid to bloom from seed, but at this site, where orchids were previously unknown, they bloomed after only 4!

Other success stories from the recovery project have been associated with management. In Lake County, an orchid site covered in brush was cleared and burned. During the next growing season, 29 orchids appeared in the cleared area. Another Lake County site with a diminished orchid population produced over 100 orchids after similar management activities. Positive results

have also been reported from other orchid sites after clearing and burning.

The recovery effort is focusing much needed attention on this rare orchid. More study is needed to gain a better understanding of the dynamics and complexities of the orchid's life cycle. In addition, little is known about the status of the hawk moths that pollinate these flowers. Portions of the seeds collected during the project are being used for research at Chicago Botanic Gardens and Morton Arboretum, where some insights have been gained. We hope this recovery project will continue to generate interest in recovery of the eastern prairie fringed orchid so that this beautiful plant will once again brighten Illinois prairies.

Jane Keibler is with the Kane County Natural Areas Volunteers and The Nature Conservancy.

The greatest populations of the eastern prairie fringed orchid historically were in Illinois, although small populations existed as far northeast as Maine, and as far southwest as Oklahoma. Currently, however, it is listed by the U.S. Fish and Wildlife Service (FWS) as threatened and is considered endangered by the Illinois Endangered Species Protection Board. In addition to habitat loss, continued threats to the species include invasion of woody vegetation, draining and conversion of wetlands, competition from exotic species, deer herbivory, and vandalism. In Illinois, the orchid currently is found at 25 sites, but many of them support only one or two individuals, and in some cases orchids have not appeared for several years.



After training, volunteers provide valuable assistance in orchid recovery through censusing populations and hand-pollinating the flowers.
FWS photo

Did They Think It Was *Labor* Day?



FWS photo

On May 30, 1997, an *arribada* (Spanish for “mass ascension”) of more than 300 female Kemp’s ridley sea turtles (*Lepidochelys kempi*) crawled up onto the beach at Rancho Nuevo on Mexico’s northeast coast, the species’ only substantial nesting area in the world. It was the largest arribada observed on a single day since 1978, when a binational program began monitoring this beach. While this is encouraging news, the Kemp’s ridley is still the most endangered species of sea turtle. The common nesting level in historical times was illustrated by the now famous *arribazón* (big arribada) filmed one day in 1947, when 42,000 Kemp’s ridley females ascended the same beach to lay their eggs.

Prior to the 1960’s, the Kemp’s ridley was exploited heavily for its eggs. Hundreds of thousands of eggs were hauled off every year, eventually taking an enormous toll on the species’ population. The Mexican government now protects the turtles and their nesting beach. Under a 20-year cooperative effort between Mexico and the United States to recover the Kemp’s ridley, the Fish and Wildlife Service (with assistance from the National Marine Fisheries Service, as well as conservation organizations and academic institutions) helps to maintain six Kemp’s ridley conservation camps at and adjacent to Rancho Nuevo. Each year, multinational teams of beach workers and supervisors count and tag female turtles, nests, eggs, and hatchlings. Nests prone to predation by dogs, coatimundis, and other predators are fenced into corrals, screened, or placed in nest boxes for protection. Hatchlings emerge after incubating in

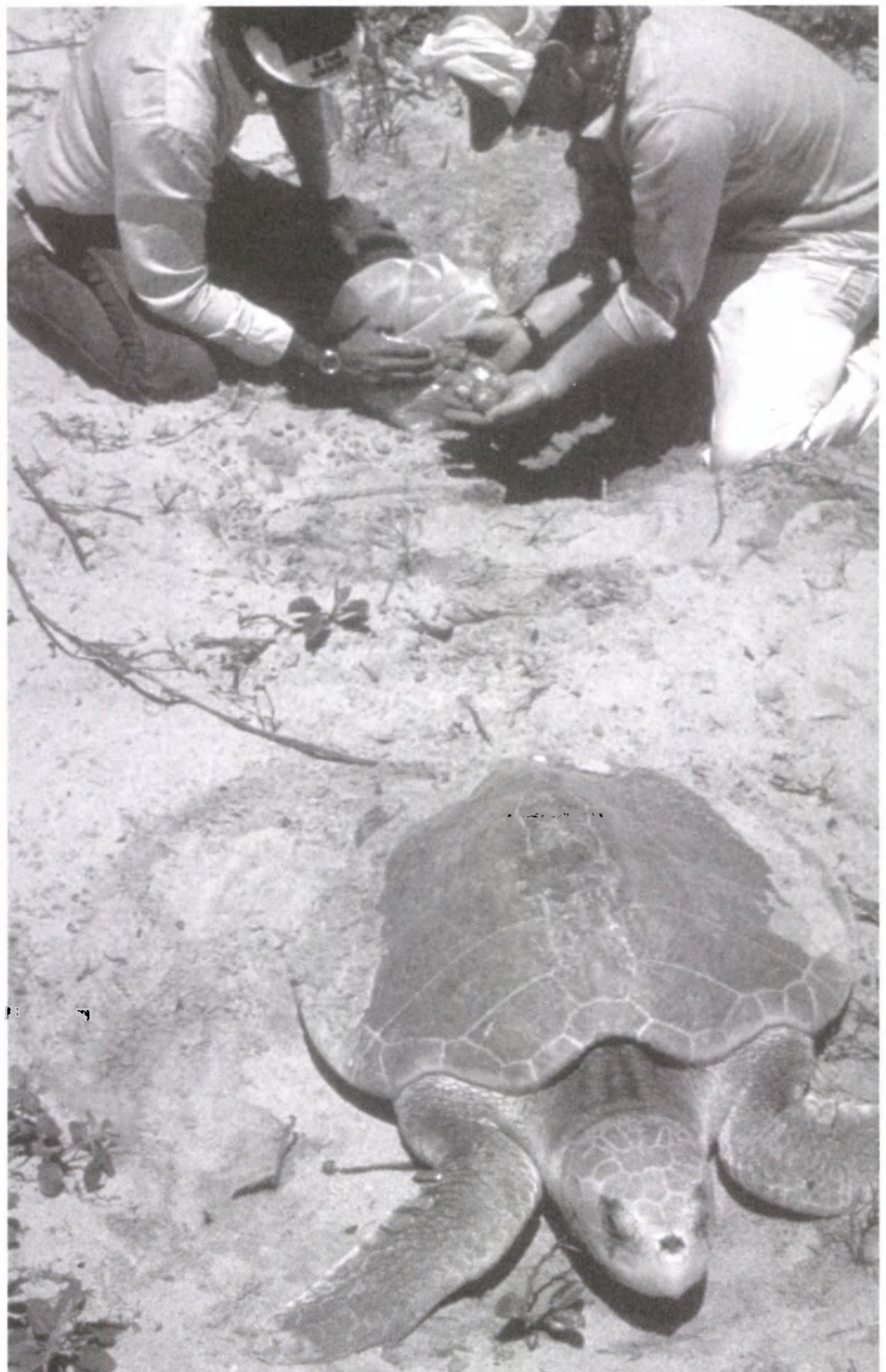
the sand for 42 to 62 days. The main cause of mortality at the nesting beach is predation of eggs and hatchlings. Ghost crabs, birds, and fish find the hatchlings particularly tasty. At sea, turtles of all ages are vulnerable to drowning in shrimp nets.

Numbers of Kemp’s ridley nests, eggs, and hatchlings produced have grown slowly but steadily since data collection began, from 924 nests, 85,217 eggs, and 48,009 hatchlings in 1978 to 2,080 nests, 191,974 eggs, and 119,196 hatchlings in 1996. In 1997, 2,387 nests were documented. If we estimate that each nest contains 100 eggs, that suggests a possible 238,700 eggs were produced this year. As of September, 149,567 hatchlings had been released.

Progress in recovery of the Kemp’s ridley sea turtle would not be possible without the continued dedication and work of many partners. Credit goes to representatives of SEMARNAP (Secretaría

de Medio Ambiente Recursos Naturales y Pesca); Gladys Porter Zoo of Brownsville, Texas; Lower Rio Grande, Santa Ana, and Laguna Atascosa National Wildlife Refuges; INP (Instituto Nacional de Pesca); Tamaulipas State Government Pesca; CRIP Tampico (Centro Regional de Investigaciones Pesqueras); La Pesca Port Authority; UAT Shrimp Laboratory in La Pesca (Universidad Autonoma de Tamaulipas); PROFEPA (Procuraduria Federal del Medio Ambiente); and Scouts from Ciudad Madero and Tampico, Mexico. Also assisting in the efforts are citizens and scientists from Ciudad Victoria, Mexico; the Universidad del Noreste; Universidad Autonoma de Tamaulipas; Universidad Autonoma Metropolitana; University of Texas, Brownsville; University of New Mexico, Albuquerque; National Fisheries Institute; Z.B Industries; Darden Restaurant Foundation; Phillips Petroleum Company; Texas Shrimp Association; Texas Parks and Wildlife Department; HEART (Help Endangered Animals—Ridley Turtles) of Houston, Texas; and Sea Turtle, Inc., of South Padre Island, Texas. With this level of cooperation, and with continuing increases in nesting success, the chances for recovery of the world's rarest sea turtle are beginning to look brighter.

Leslie Dierauf is a Fish and Wildlife Biologist in the FWS Regional Office in Albuquerque, NM.



At maturity, the Kemp's ridley sea turtle measures up to 26 inches (66 centimeters) in diameter and can weigh from 80 to 100 pounds (36 to 45 kilograms). This species matures slowly; females do not return to their beaches of origin to lay eggs until 8-15 years of age. Less is known about the comings and goings of the males, since they remain at sea year-round. An omnivorous species, the Kemp's ridley feeds on crustaceans, swimming crabs, fish, jellyfish, and molluscs. Nests vulnerable to predation are fenced, screened, or removed for protection of the eggs.

FWS photo

by Brian A. Cooper,
Paul Henson, and
Martin G. Raphael

Use of Radar for the Study of Rare Birds



Marbled murrelet

Photo by Jeff Hughes

Mobile radar laboratories are being used for many studies, including research on threatened and endangered species. Currently, we are evaluating radar as a tool for inventory and population monitoring of marbled murrelets (*Brachyramphus marmoratus*) in the Pacific Northwest and Alaska. This small seabird usually nests in older, large-diameter trees in late successional forests within about 60 kilometers (37 miles) of the coast. Using standard audio-visual survey techniques to collect biological information on this species has been difficult because of the low light levels encountered during the murrelet's early morning and late evening flights to nesting areas and because of the

A problematic area for wildlife researchers has always been the study of nocturnally active birds, including the many species of seabirds that visit their breeding colonies only after dark and the numerous species of waterfowl, shorebirds, and songbirds that migrate at night. Even the most basic information on distribution, flight behavior, and timing of flights is inadequate for many of these species, including some threatened and endangered birds. Fortunately, recent advances in radar and night-vision technology make the job of obtaining this vital information far less difficult.

Radar is not a new technology; it has been used in the study of bird movements for nearly five decades. During World War II, some of the first radar operators saw "angels" on their radar screens over areas that they knew were devoid of aircraft. When these odd signals turned out to be birds, the field of radar ornithology was born. Although

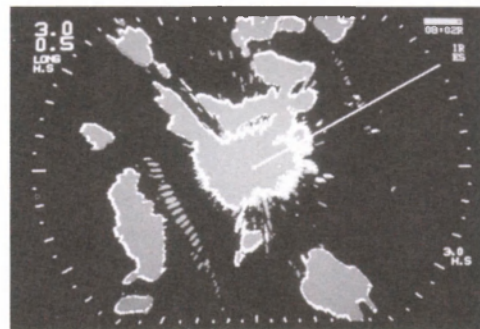
these older radars provided much interesting information on bird migration, they were difficult to use and were not always available to ornithologists. Recent improvements in small marine radars (i.e., increased ease of use, smaller size, and lower cost) have made them more accessible to biologists.

RADAR stands for Radio Detection And Ranging. Pulses of electromagnetic radiation are sent out from the radar antenna, and it receives the electronic "echoes" that are reflected back from an object (e.g., a bird, plane, or ship). Because radio waves travel at the speed

of light, the distance to the object is related to the time elapsed between transmission and reception of the echo. The distance at which an object can be detected depends on many factors, including the size of the object and the wavelength and power output of the radar. For birds, this distance may vary from a few hundred meters for the smallest marine radars to over 150 kilometers (93 miles) in the case of long-range surveillance radars.

The mobile radar laboratories that we used for bird studies consist of two small marine radars that often are mounted on a four-wheel-drive pick-up truck. One of the radars (surveillance) is used to scan the entire area around the lab. It gathers information on flight paths, movement

rates, and ground speeds of flying birds. A second radar (vertical) was modified to measure altitudes of flight as birds cross the vertically-oriented radar beam. The



lab can be powered by a generator or deep-cycle batteries; when fully charged, four six-volt golf cart batteries can power the lab continuously for about 14 hours. (A full description of a radar laboratory can be found in Cooper et al. 1991, *Journal of Field Ornithology* 62: 367-377.)

The lead author also has used radar and night-vision techniques to study the endangered dark-rumped petrel (*Pterodroma phaeopygia sandwichensis*) and threatened Newell's shearwater (*Puffinus auricularis newelli*) in the Hawaiian Islands. Due to their nocturnal habits and the inaccessibility of their

remote, mountainous nesting colonies, there was a paucity of basic biological information on these species, including daily movements. On the island of Kaua'i, nocturnal patterns of movements, information on distribution and abundance on an island-wide scale, and the impacts of powerlines on these birds were studied (see Day and Cooper 1995, *Condor* 97: 1011-1027). As a result of these findings, several recommendations of ways to reduce collision mortality of dark-rumped petrels and Newell's shearwaters have been made. These data also were used to obtain an index of population sizes for these species on Kaua'i. On the island of Hawai'i, a variety of groups, including the Biological Research Division of the U.S. Geological Survey, used radar technology to obtain information on distribution and activity patterns at various locations.

Obviously, a variety of studies can be undertaken with ornithological radar, and we hope to encourage its development so that further refinements will become available and add to the "toolbox" available to ornithologists. This is not to say that radar detects all birds in an area; it is a sampling tool that has its own biases and limitations. The major limitations of a marine radar system are (1) the actual number of birds represented by each radar target on the radar's display screen is unknown; (2) identification is based on flight speed and behavior, so misidentifications can occur if two or more similar species occur in the location being sampled; (3) ground clutter (echoes from surrounding vegetation, hillsides, and other objects) can obscure large parts of the screen; and (4) birds cannot be detected during periods of moderate to heavy precipitation. Fortunately, careful placement of the radar lab and concurrent visual observations with night-vision or forward-looking infrared (FLIR) devices can minimize these limitations.

What other questions can we try to answer with the radar? We hope to use radar to study the relationship between at-sea densities and inland abundance of marbled murrelets and to learn more about the strengths and limitations of the current audio-visual survey protocol for marbled murrelets. In the Hawaiian Islands, we hope to develop radar as a monitoring tool and to continue to learn more about breeding distributions of dark-rumped petrels and Newell's shearwaters. There are many other colonies of nocturnally active seabirds in the tropical Pacific and elsewhere for which radar could be used to obtain valuable biological information. In fact, radar may be the only cost-effective way to obtain initial information on the distribution and abundance of nocturnally active species that breed in inaccessible locations. In arctic regions, radar could be employed to help count the passage of common, king, and spectacled eiders (*Somateria mollissima*, *S. spectabilis*, and *S. fischeri*, respectively) at bottlenecks in their migration corridors. We look forward to continued cooperation with a variety of Federal, State, and non-governmental organizations to improve the use of radar as a conservation tool.



Inset photos by Brian A. Cooper

Brian A. Cooper is with ABR, Inc., in Forest Grove, OR; Paul Henson is with the U.S. Fish and Wildlife Service, Office of Technical Support, in Portland, OR, and Martin G. Raphael is with the USDA Forest Service, Pacific Northwest Research Station, Olympia, WA.



Marbled murrelet

Photo by B. "Moose" Peterson

small size, cryptic coloration, and rapid flight speed of these birds. Further, because over 85 percent of the murrelets that are detected are heard but not seen, it is not possible to determine accurately the number of birds flying over a particular area with this traditional sampling technique. Radar does not have this auditory bias; radar data have been used to show that audio-visual observers can miss a large proportion of the murrelets flying inland during their early morning activity period. Under proper conditions, radar may be one of the best tools we have for obtaining an accurate index of murrelet abundance in a particular river drainage.

Goldenseal: Facing a Hidden Crisis



U.S. Forest Service photos

Imagine trying to protect a rare plant when its wild stock is used widely in pharmacies and herbal stores as an ingredient in various medicinal products. This is the problem Federal and State agencies face in trying to maintain the viability of wild goldenseal (*Hydrastis canadensis*). A perennial in the buttercup family, goldenseal is second only to ginseng (*Panax quinquefolius*) in commercial importance to the North American medicinal plant trade. Because it is said to have a synergistic effect when used with other herbal substances, goldenseal is used in a wide variety of preparations.

Population Viability and Plant Collection

Because of habitat loss and collection pressure, wild goldenseal numbers have declined markedly since Euro-Americans began using it as a medicinal plant in the early 1800's. In 17 States, it is now considered critically imperiled, imperiled, or uncommon, based on categories developed by The Nature Conservancy (TNC 1995). In Canada, goldenseal is considered threatened.

Concern about the heavy trade in goldenseal led to the listing of this species on Appendix II of CITES (Convention on International Trade in Endangered Species), effective in September 1997. The CITES listing means export permits are now necessary for international trade of goldenseal. Such provisions have been in effect for ginseng for some time.

Goldenseal grows on rich, mesic mixed hardwood sites in 27 States and Ontario, Canada. The core populations, however, occur in the hills of the dissected Appalachian Plateau in

western West Virginia, eastern Kentucky, Ohio, Illinois, and Indiana. Habitat loss has resulted from logging and conversion to agricultural lands. Local wildcrafters (those who gather plants and other native products for commercial gain) collect this species on both private and public lands. The extent of this collection is difficult to quantify.

On some National Forests in the center of goldenseal's range, special use permits are required for collection. On others, permits are prohibited because of the plant's rarity. Permit data indicate that the harvest of goldenseal is increasing. On the Hoosier National Forest (Indiana), unlimited collection permits of goldenseal increased from 176 in 1993 to 519 in 1996 (Olsen 1997). At the same time, wholesale values for the wild stock increased 600 percent from 1989-1994 (Oliver 1994).

The Monongahela National Forest in eastern West Virginia has chosen not to issue collection permits for goldenseal because of the species' scarcity in that area. Inventory data gathered by Monongahela biologists shows goldenseal to be rarer than ginseng, which itself is becoming scarce. Because goldenseal is found in mixed mesophytic coves that also support high timber values, logging in the region is undoubtedly affecting populations, but as with collecting, it is difficult to develop precise estimates. Also, it is important to note that the hills of the Appalachian Plateau, in the western part of the State, probably support more goldenseal per unit area than the higher elevation National Forest (Grafton, pers. comm.). Hence populations on the Monongahela, while certainly important, may not be adequate to ensure the





species' survival if other areas are not conserved. We suspect this may be true of other National Forests as well.

Consumption of goldenseal is likely to increase in the foreseeable future. Freed (1996), a timber specialist, points out the need to develop a dialogue on management of commercial, non-timber plants. Some biologists feel that plants such as goldenseal are not being protected quickly enough and that inadequate documentation on threats from overcollecting and forest management may be affecting the species' viability in the wild. Others see the private sector regulating itself through conservation initiatives, such as working with wildcrafters and establishing a self-imposed trust fund in which a fraction of proceeds from goldenseal products could be set aside for management and conservation (reported by C. Robbins, pers. comm.).

Monitoring and Conservation

Limited monitoring of wild goldenseal stocks takes place through federally sponsored plant surveys and State Natural Heritage Programs. One result of the CITES listing is that trade in goldenseal can now be more carefully monitored through CITES export or re-export permits for international trade (ICUN 1997).

Meanwhile, botanists continue to examine cultivation and conservation education strategies. One problem with cultivation is that growing commercially viable stock requires four years. As native stocks dwindle, perhaps cultivation will become more viable commercially, as it has for ginseng. A combination of cultivation, conservation education through buyers, and industry self-regulation may be the best set of approaches to maintaining goldenseal, a priceless component of Appalachian biodiversity. In any case, the awareness of goldenseal and other non-timber commercial plants as a conservation management issue must be elevated. Their effective management on public land remains a "hidden" crisis in natural resource conservation.

J.A. Concannon and T.E. DeMeo are ecologists with the Monongahela National Forest in Elkins, WV.

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Correction

A caption on page 9 of the September/October 1997 *Bulletin* added by the editorial staff should have stated that the American black bear (*Ursus americanus*) is managed effectively by the States, and is not believed to be threatened by the trade in its parts for use in traditional medicines or by other factors. On the other hand, Asian bears, currently included in CITES Appendix I, are indeed believed to be threatened by the international trade in their gall bladders for traditional medicinal use. Further, the caption to the elephant photograph on page 13 should have read, "Scenes like this will continue if CITES implementation and enforcement, and conservation efforts by range states, remain effective." We regret the error.

Swainson's Hawk Gains New Protection

by Laurie Hunter

Several years ago, wildlife researchers began to observe unexplained changes in the Swainson's hawk (*Buteo swainsoni*) population in North America. However, thanks to a cooperative multinational effort assisted by the U.S. Fish and Wildlife Service's (FWS) Office of International Affairs, the mystery may be solved and the threat to this impressive bird of prey greatly reduced.

The Swainson's hawk is a long-distance migrant, flying more than 6,000 miles (9,650 kilometers) from its breeding grounds in the western North American prairies and grasslands to spend the non-breeding season in the grasslands of Argentina. Voracious eaters of insects and small mammals, the hawks are often found near agricultural fields, preying on pests such as grasshoppers. Over the past 3 years, experts from the U.S. Forest Service, Snake River Field Station of the U.S. Geological Survey's Biological Resources Division, Boise State University, and University of Minnesota captured Swainson's hawks, fitted them with small radio transmitters, and tracked them during migration.

One of the likely causes for the dramatic population changes was found in Argentina. In the winter of 1995-96, biologists estimate that approximately 20,000 hawks were poisoned by agricultural pesticides. An international alert caught the attention of toxicologists from the FWS, Canadian Wildlife Service, Clemson University, and USGS Biological Resources Division. They found that the deaths were caused by the pesticide monocrotophos, which was used to kill grasshoppers in alfalfa fields.

Because of its long-established connections with conservationists in Argentina, the FWS Office of Interna-

tional Affairs was able to expedite action to prevent further hawk kills. The FWS had developed these strong relationships through the Graduate Program in Biodiversity Conservation and Management, a partnership between the Office of International Affairs and the Centro de Zoología Aplicada de la Universidad Nacional de Córdoba, Argentina.

Funds provided by the Office of International Affairs enabled Argentine agencies—specifically, the Instituto Nacional de Tecnología Agropecuaria (INTA), Servicio Nacional de Sanidad y Calidad Agroalimentaria (SENASA), and Secretaría de Recursos Naturales y Desarrollo Sustentable (SRNyDS)—to improve wildlife management techniques in agricultural lands and conduct a widespread education campaign to prevent the incorrect use of monocrotophos. In addition, the American Bird Conservancy worked with Ciba-Geigy Limited (Novartis Corporation), the main supplier of monocrotophos in Argentina, to prevent farmers from using this pesticide on alfalfa. Thanks to an enormously successful campaign and a lower grasshopper infestation, only 24 hawks were reported killed last winter.

However, the threat to hawks and other wildlife is not over, and the FWS is continuing its support to INTA, SENASA, and SRNyDS for further education and extension work. By using fewer toxic chemicals and more Integrated Pest Management techniques, the farmers in Argentina will be able to grow viable crops while protecting habitat for hawks and other wildlife.

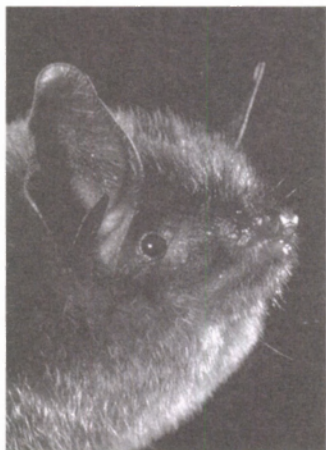
Laurie Hunter is a Wildlife Biologist in the FWS Office of International Affairs in Arlington, VA.



The Swainson's hawk is an impressive brown and tawny bird, standing almost 2 feet (0.6 meters) tall and possessing a wingspan of 54 inches (137 centimeters).

Photo courtesy of the FWS Office of International Affairs

Partnership To Protect Endangered Bats



Indiana bat

Photo by Merlin D. Tuttle, BCI©

Human disturbance during hibernation can cause a bat to expend two to three weeks of energy reserves. Continued arousal from hibernation could lead to starvation before spring. In addition, many thousands of bats across the country have been beaten, burned, or buried alive by humans, primarily due to fear or ignorance. These harmful actions show that many people are unaware of the key ecological role that bats play in the environment. Bats may consume one half or more of their own body weight in insects, some of which include costly agricultural and forest pests, each night. Other bats, such as those in the Southwest, serve as pollinators and seed dispersers. It has been estimated that 70 percent of the tropical fruit available at the market is from plants that bats have pollinated.

Driven from caves due to increased human intrusion and disturbance, some bat populations have come to rely on abandoned mines for nursery and hibernation sites. Logging of old-growth forests has further reduced traditional bat roosts. Bat Conservation International (BCI) estimates that one-quarter of the bat species in the United States now depend almost exclusively on abandoned mines or caves.

It was during this century that many of the displaced bats began to use abandoned mines for either nursery or hibernation sites. The change-over did not come easily, considering the fact that bats will use the same crevice in a mine or cave each year. The microclimate of a site, particularly the temperature, is what determines whether or not it is suitable for hibernation. Between September and November, when bats enter hibernation, the mine temperatures typically will not exceed 53°F and will average between 34° and 50° F by mid-winter. In the northern United States, however, bats will rarely raise young in mines simply because they are too cold. BCI states that typically it is mines with the largest passages and multiple entrances at slightly different elevations that are the most likely to be used by bats.

In the Adirondack Mountains of upstate New York, a cooperative project has resulted in the protection of a major winter bat hibernaculum. According to BCI, Graphite Mine is one of the three most important abandoned mine hibernacula known in North America and the most significant in the northeastern U.S. Graphite Mine provides crucial winter habitat for six species of bats and contains approximately 120,000 bats,

including the endangered Indiana bat (*Myotis sodalis*) and a species of special concern, the small-footed bat (*Myotis leibii*). Graphite Mine is believed to contain the second-largest concentration of small-footed bats in North America.

Graphite was discovered in the area in 1887 by a landowner skidding logs on his property. Soon, a bustling mining town was born. Years later, it became cheaper to obtain graphite from Madagascar; Graphite Mine was last worked in 1921. In 1992, the International Paper Company purchased 1,900 acres (770 hectares), which included the mine, for timber. The Nature Conservancy (TNC), aware that the abandoned mine was one of the most significant hibernacula in the northeastern U.S., purchased a conservation easement that year from International Paper. Included in the easement was a "quiet zone" around each of the mine's openings.

Despite these measures, TNC noted repeated unauthorized access to Graphite Mine. In response, TNC visited the site in 1996 with representatives of BCI to assess the mine's security. They determined that installation of bat-compatible steel gates at each of the mine's openings could ensure the population's protection. Next, they

enlisted the help of Roy Powers, an engineering professor at Mountain Empire Community College in Virginia and a member of the American Cave Conservation Association. Powers has been designing and building bat gates for almost 20 years. One of the main bat gates constructed this year at Graphite Mine marked his 125th gate.

Constructed of steel angle-iron, the proper design of bat gates is extremely important. Gates should not obstruct the normal air-flow through the mine's entrances. Spacing of vertical and horizontal members of the gate has to be taken into consideration in order to keep out unauthorized visitors but allow free access for the bats. Construction of bat gates should take place during the time of year when the mine is not being used by bats. In the case of Graphite Mine, construction of the 10 bat gates took place in June.

Since the construction of bat gates can be expensive, developing partnerships is crucial. The partners that financed or provided assistance with construction of the gates at Graphite Mine included The Nature Conservancy's Adirondack Chapter, International Paper, Bat Conservation International, British Trust For Conservation Volunteers, New York State Department of Environmental Conservation, and U.S. Fish and Wildlife Service's Partners For Wildlife and Endangered Species Programs. Each partner contributed money, materials, time, or simply elbow grease in order to construct the 10 gates over a 10-day period. This successful partnership not only succeeds in protecting the 120,000 bats that will hibernate in Graphite Mine each winter, but also forges friendships that should last a lifetime.

Dianna Ellis is a Fish and Wildlife Biologist for the Partners For Wildlife Program in the FWS Cortland, New York, Field Office.



According to Bat Conservation International, more than half of the 43 bat species living in the continental U.S., including some of the largest populations of endangered bats, roost in mines. Protection of this habitat is extremely important to the bat's survival. Because abandoned mines are very dangerous to humans, but yet may provide critical habitat for bats, the construction of bat-compatible gates appears to be the answer. This gate, built to protect a cave in New Jersey, is one example of such a protective barrier.

Photos by Peter J. Lekos



Mark Twain's Endangered Ecosystem



Wild false indigo

Photo by Lynda Richards

Sometimes a term like “national forest” doesn’t tell an area’s whole story. For example, Mark Twain National Forest, composed of management units scattered throughout the southern half of Missouri, contains not only forests but a rich mosaic of prairies, glades, savannas, and woodland ecosystems. Many historical accounts describe large regions of the pre-European Missouri Ozark landscape as open, grassy woodlands with a well developed ground flora—in other words, a savanna.

Savannas are grasslands interspersed with trees and maintained by fire. Dendrochronologists (scientists who study the past through analyzing the growth rings of trees) have discovered that fire burned through most of the Missouri Ozark uplands on an average of every 3 to 15 years. Two centuries ago, savannas like those in Mark Twain National Forest occupied up to half the landscape in the Midwest, or 30 million acres (12 million hectares), especially along the forest-prairie border. Today, savannas have almost disappeared because of conversion to pasture, timber cutting, and fire suppression. In fact, oak savannas and open oak woodlands are among the world’s most threatened plant communities. The Nature Conservancy rates Midwest savannas as “globally endangered,” and the Environmental Protection Agency chose the Midwestern Oak Savanna for its first Ecosystem Recovery Project. (Recovery plans for individual threatened and endangered

species are familiar, but here is recognition that an entire ecosystem is at risk.)

A common Missouri savanna type is post oak (*Quercus stellata*) with a little bluestem (*Schizachyrium scoparium*) understory. But it’s the variety of plants restricted to grasslands and savannas that adds most to the community richness: purple coneflower (*Echinacea purpurea*), rattlesnake aster (*Eryngium yuccifolium*), leadplant (*Amorpha canescens*), wild false indigo (*Baptisia bracteata*), and several hundred others. Among the more uncommon species are bald grass (*Sporobolus ozarkanus*), reed bent grass (*Calamagrostis porteri insperata*), Ozark chinkapin (*Castanea pumila ozarkensis*), Ozark spiderwort (*Tradescantia ozarkana*), Ozark wake robin (*Trillium pusillum ozarkanum*), Ozark corn salad (*Valerianella ozarkana*), yellow wood (*Cladrastis kentuckea*), Cherokee sedge (*Carex cherokeensis*), false foxglove (*Agalinis skinneriana*), soapberry (*Sapindus drummon-*

dii), soapweed (*Yucca glauca mollis*), umbrella plant (*Eriogonum longifolium*), Trelease's larkspur (*Delphinium treleasei*), Missouri alumroot (*Heuchera parviflora parviflora*), shrubby spurge (*Phyllanthus polygonoides*), Bush's poppy-mallow (*Callirhoe bushii*), Mead's milkweed (*Asclepias meadii*), sand phlox (*Phlox bifida stellaria*), and purple beard-tongue (*Penstemon cobaea purpureus*). A large number of these plants are Ozark endemics, as indicated by scientific or common name. Savannas also provide habitat for many wildlife species, from neotropical migrant songbirds to popular game species, reptiles, and insects.

Mark Twain National Forest's efforts to preserve midwestern biodiversity began nearly 20 years ago in southwest Missouri, where savannas are associated with extensive glades, another fire-dependent ecosystem. Prescribed fires help to maintain the beauty of the scenery along the Glade Top Trail, a National Scenic Byway. Under a cost-share agreement, The Nature Conservancy prepared an extensive "Baseline Ecological Assessment" for five Mark Twain National Forest savannas in the north-central Ozarks. Staff of The Nature Conservancy, Morton Arboretum, and the University of Missouri are involved in monitoring the effects of prescribed burns and the progress toward habitat restoration. Monitoring projects are focusing on hydrology, vegetation (from timber to grasses to lichens, which are potential indicators of air quality), insects, birds, mammals, and reptiles and amphibians. One objective is to determine whether relatively cool-burning fires cause unacceptable damage to the overstory trees. The project also involves coordination with the National Wild Turkey Federation, local rural fire department, local residents, and State natural resource agencies.

Much has already been learned from the savanna projects. Monitoring has revealed greatly increased herbaceous production, with more flowering and higher seed production on burned than



White oak savanna

Photo by Lynda Richards

on unburned areas. Mammal populations have increased, and bird numbers and diversity are higher, probably as a result of increased plant growth. Mark Twain Natural Forest currently burns only about 7,000 acres (2,830 ha) per year, out of a total of 1.5 million acres (0.6 million ha), but the habitat benefits gained thus far may lead to increases in the future.

Lynda Richards is an Ecologist with Mark Twain National Forest.

Prescribed burning is sometimes needed to maintain the health of savanna ecosystems.

Photo by Lynda Richards



by Gail Presley
and Martin Potter

Restoring the “Hogwallows”



**Collecting *Sporobolus* seeds
for revegetation of
hogwallows**

Photo by Gail Presley

Imagine you're on a trip through the San Joaquin Valley in California, traveling south down State Highway 43 in southwestern Tulare County. If it's winter, you probably can't see much because the “tule” ground fog is too thick to see even the lines on the highway. If it's summer, the temperature passed the 100-degree mark at 8:30 a.m. But this scrubby, desert environment contains an unusual type of habitat—“hogwallows”—supporting several vulnerable species, including three listed as threatened or endangered by both the State and Federal governments.

The California Department of Fish and Game (CDF&G) recognized the importance of hogwallow habitats to threatened and endangered species as early as the 1970's. The Wildlife Conservation Board, the real estate branch of CDF&G, purchased the first three 160-acre (65-hectare) parcels in the early 1980's. These parcels became the cornerstones of the Allensworth Ecological Reserve. Biologists from CDF&G and The Nature Conservancy developed a Conceptual Acquisition Plan for the reserve in 1989, which sets priorities for the acquisition goal of a 10,000-acre (4,047-ha) area. CDF&G currently owns and manages 4,810 acres (1,945 ha).

Hogwallow Habitat

Hogwallows, a unique geographical feature of this area, are caused not by the presence of pigs but by the area's natural topography: an undulating terrain with hummocks that can be as much as three feet (0.9 meter) higher than the adjacent swales. The hummocks are an important habitat feature

for the animals that live here. Winter rains fill the swales, and water can stand on the clay soils for several weeks. If you are a burrowing animal, you would choose to build your home on a hummock and avoid the winter floods. Burrowing behavior has helped several endangered species—including the San Joaquin kit fox (*Vulpes macrotis mutica*), Tipton kangaroo rat (*Dipodomys nitratoides nitratoides*), and blunt-nosed leopard lizard (*Gambelia silus*)—adapt to the extreme temperatures typical of this environment. All three live in burrows, which are cool in the summer and warm in the winter. These species also restrict their activities to avoid the hottest part of the day.

Also of significance in the Allensworth area is one of the best remaining examples of alkali sink scrub, a natural vegetation community that has been reduced to only two percent of its original range in California. Alkaline soils, which typify this community, are easy to identify because the salts often form a white crust on the surface. The

plant species that occur here are adapted to the salty and hot conditions. Characteristic plant species include succulent shrubs such as iodine bush (*Allenrolfea occidentalis*) and bush seepweed (*Suaeda moquinii*), as well as salt tolerant grasses such as alkali sacaton (*Sporobolus airoides*) and saltgrass (*Distichlis spicata*).

Restoration Effort

Some habitats now owned by CDF&G at Allensworth Ecological Reserve were disturbed in the past. Under previous owners, experimental agricultural expansion included leveling the hogwallows on several parcels. During the wet winter of 1994-95, sheet flooding was observed on leveled land, confirming the theory that it was unsuitable for burrowing animals. CDF&G has undertaken a program to restore the hogwallow topography on these parcels to enhance their value for threatened and endangered species.

The first step in this program involved a pilot project of 160 acres on previously farmed and leveled land, using earthmoving equipment such as bulldozers to reestablish the hogwallow topography. To begin the process, CDF&G biologists surveyed the project site to identify areas of endangered species activity. The biologists marked areas containing concentrations of active Tipton kangaroo rat and blunt-nosed leopard lizard burrows and surveyed for potential kit fox dens. These efforts were designed to avoid any incidental take of these species during project construction. Through a cooperative agreement, the U.S. Fish and Wildlife Service lent assistance and helped State workers avoid take of the listed species.

The next step was to inspect a nearby parcel containing natural topography to estimate the number of hummocks per acre that occur naturally in the area. The estimate was used to calculate the amount of earth that would need to be moved to restore the hogwallows.

Work began in the winter of 1995-96. The earthmoving equipment operators

were instructed to scrape soil from an area and pile it up in a series of random shapes and sizes, mimicking the natural hogwallows. The mounds were constructed a bit taller than natural ones to account for erosion and settling. Conveying this idea to workers who were used to following blueprints for road and foundation construction was difficult at first, but once they got the hang of it, they were constructing up to 100 hummocks per day. And they were having fun doing it! Biologists were present on-site throughout construction to monitor compliance with the terms of the CDF&G/FWS agreement. In the end, 655 hummocks were created, and except for the lack of vegetation, the topography looked very natural. Additionally, no take of endangered species occurred. The proof of success, however, is in monitoring species activity on the site.

Results

By the following spring, burrowing animals had already begun to recolonize the area. More San Joaquin pocket mice (*Perognathus inornatus*), a California Species of Special Concern, were captured on the project site in the spring of 1996 than at any of the natural habitat sites within Allensworth Ecological Reserve. Plant growth also had

**Through scraping and piling,
a level field is recontoured
as a hogwallow.**

Photo by Gail Presley



Recovery for many San Joaquin Valley endangered species depends on maintaining enough suitable habitat throughout their range. Restoration of habitat on retired or non-viable agricultural lands will be an important component of the recovery strategies. The information gained from the restoration program at the Allensworth Ecological Reserve will be shared with other governmental agencies and land management organizations to help them meet their restoration objectives. In an age where there is never enough funding to accomplish all of the necessary research and management, sharing information will help others learn from our experience.

Among the endangered animals associated with hogwallow habitats are the San Joaquin kit fox, blunt-nosed leopard lizard, and Tipton kangaroo rat.

Photos by B. "Moose" Peterson

begun (primarily annual grasses), and in the winter of 1997 almost all of the hummocks were covered with vegetation. Unfortunately, no Tipton kangaroo rats or blunt-nosed leopard lizards were observed on the project site, but very few of these were seen anywhere on the reserve in 1996. It will take several more years to completely evaluate the effectiveness of the project, but so far we consider this first phase a success. We will continue to monitor the site at least annually for species activity.

Phase Two and Beyond

Phase two of the project began in April 1997 and will result in another 160 acres of restored topography. This habitat restoration project is one of several planned at the Allensworth Ecological Reserve. Our goal is to restore the hogwallow topography on all 1,100 acres (445 ha) of the leveled CDF&G-owned land. The reserve will serve as a testing area to evaluate the effectiveness of this and other endangered species habitat management tools, such as controlled burning and grazing. We hope that what we learn at the Allensworth Ecological Reserve can be

applied to other CDF&G lands containing alkali sink scrub habitats.

The Allensworth Ecological Reserve is open for passive public uses such as hiking, bird watching, and nature study. For more information, please contact the California Department of Fish and Game office in Fresno at (209) 243-4017.

Gail Presley is an Associate Biologist (Wildlife) in the Wildlife Management function of the California Department of Fish and Game in Visalia. Martin Potter is an Associate Biologist (Wildlife) in the Natural Heritage function of the California Department of Fish and Game in Hanford.



Have A Story to Share?

**Let us publish it in the
Endangered Species Bulletin!**

The *Endangered Species Bulletin* (ESB) was created in 1976 to meet the growing demand for news of developments in the endangered species program of the U.S. Fish and Wildlife Service. Current distribution of this publication numbers over 7,000, including local, State and Federal agencies, non-profit organizations, members of Congress, and official program contacts (both nationwide and international).

Because of its increasingly diverse audience, the ESB is seeking to diversify and expand its coverage of endangered species issues. To be successful, we need your help. Material on a wide range of topics relating to endangered species is welcome and may be technical or popular in nature. We are particularly interested in success stories and news about recovery (both the development of recovery plans and their implementation). Material also is needed on interagency consultations; Habitat Conservation Plans; other cooperative ventures with Federal and State agen-

cies, conservation organizations, business, and private landowners; changes in a species' status; and new threats to important habitat.

Contributors are encouraged to contact the *Bulletin* editor (703/358-2390) before preparing a manuscript to determine the length, focus, and timing of proposed articles. We welcome all submissions but cannot guarantee their publication. Manuscripts may be edited for length, style, and clarity. The *Bulletin* staff will consult with authors on all changes that may affect the content of a manuscript and authors will have an opportunity to review edited material before publication. Credit will be given for all published articles, illustrations, and photographs.

Helpful Hints:

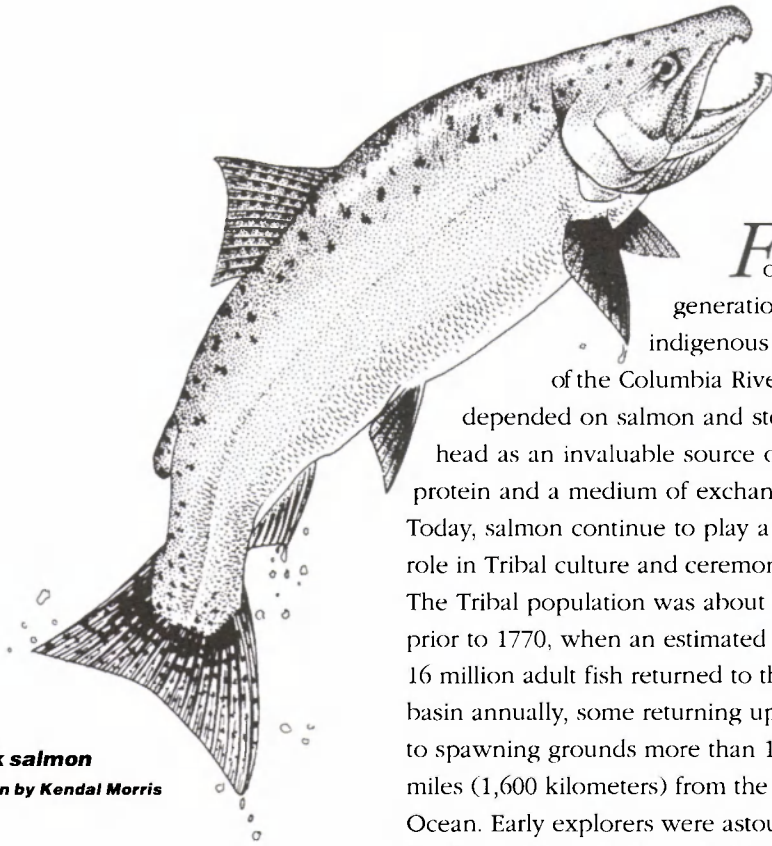
- feature articles are generally 800 to 1,000 words in length (shorter ones are OK, too)
- provide both common and scientific names when referencing listed and non-listed species
- provide metric equivalents for all measurements; C and F equivalents for all temperatures
- include author's name, position, duty station, address, and telephone and fax numbers
- include photographs or line drawings whenever possible (materials will be returned)
- submit article electronically via Internet gateway to
R9FWE_DES.ESB@fws.gov
- articles can also be sent on diskette to USFWS, 880 ARLSQ, Washington, D.C. 20240

The ESB is on a bimonthly printing schedule and each issue is developed around a distinct theme. Upcoming themes are listed below. While contributions are welcome at any time, material not received by the "Article Due" date will be held for a future issue.

ISSUE DATE	ARTICLE DUE DATE	ISSUE THEME
March/April 1998	February 1, 1998	Recovery/benefits of biodiversity
May/June 1998	April 1, 1998	Neotropical migratory birds
July/August 1998	June 1, 1998	HCPs, Safe Harbors, Candidate Conservation
September/October 1998	August 1, 1998	Island ecosystems
November/December 1998	October 1, 1998	Alaskan species and arctic ecosystems

by Judith Maule

Salmon Restoration at Columbia River Hatcheries



Chinook salmon

Illustration by Kendal Morris

For many generations, the indigenous people of the Columbia River Basin depended on salmon and steelhead as an invaluable source of protein and a medium of exchange. Today, salmon continue to play a central role in Tribal culture and ceremonies. The Tribal population was about 10,000 prior to 1770, when an estimated 10 to 16 million adult fish returned to the basin annually, some returning upriver to spawning grounds more than 1,000 miles (1,600 kilometers) from the Pacific Ocean. Early explorers were astounded by the numbers of salmon in the rivers.

As the Euro-American population grew, the Native American population decreased, along with the numbers of salmon and steelhead. Today, the total human population in the Northwest exceeds 10 million people, but only about 1.6 million wild and hatchery-produced salmon now return to the region annually. Despite reduced numbers, however, salmon remain the symbol of the Pacific Northwest. Their economic value can be estimated, but their biological and cultural value is immeasurable.

When modern-day Columbia River explorers come to the Pacific Northwest to see salmon, the scene is considerably different than it was in the late 1700's and early 1800's. Many people are quick to equate the decline of salmon with construction of dams, but other human

actions posed threats to salmon long before dams changed the free-flowing river to a series of reservoirs. Dams are one important component of a complex series of events and changes in the river. More than a century ago, as advances in technology intensified exploitation of natural resources—including logging, mineral extraction, agriculture, transportation, hydroelectric power generation, and commercial fishing—fisheries biologists searched for ways to protect the remaining salmon and to restore fish populations. In 1871, President Ulysses S. Grant signed legislation creating the U.S. Fish and Fisheries Commission and charged it with restoring the country's foodfish stocks.

Little White Salmon NFH

In 1896, the Commission conducted investigations in Idaho, Oregon, and Washington to extend fish-culture operations and establish hatcheries to maintain existing salmon population levels. Tributaries of the lower Columbia River, including the Little White Salmon River, were included in these surveys. In 1896, Professor B. Evermann and Dr. S. Meek examined the Little White Salmon River and found it such a good prospect that they established a collecting site at the mouth of the river. They quickly built a rack across the river and constructed a simple hatchery, sleeping quarters, and messhouse. Salmon were already spawning naturally in the river

by the time the early fish culturists were ready to begin taking eggs. In 20 days, they collected more than 2 million eggs.

By 1898, the Little White Salmon National Fish Hatchery (NFH) in Cook, Washington, had been expanded to handle 30 million eggs. It initially raised only fall chinook (*Oncorhynchus tshawytscha*) salmon, but now raises spring chinook, fall chinook, and coho (*Oncorhynchus kisutch*) salmon. Coho salmon eggs are moved to the Willard NFH, about 5 miles (8 km) up the Little White Salmon River, where the coho are hatched and raised for release. These hatcheries play an important role in mitigating salmon losses due to Columbia River dams. In addition to providing fish for Native Americans, the salmon contribute to commercial and recreational harvest in the ocean and the Columbia River.

Spring Creek NFH

In 1901, what is now the Spring Creek NFH in Underwood, Washington, began as an egg collecting station. Rowboats carried eggs taken on the Big White Salmon River to temporary, tented troughs 2 miles (3.2 km) west on Spring Creek to use the cold, pure spring water. Eggs were incubated, then released into the Big White Salmon River as unfed fry. Some of these fry escaped into Spring Creek and, several years later, returned to the site as adults. The Underwood station was soon established to take advantage of the excellent rearing conditions at the site. In 1951, the hatchery was renamed the Spring Creek National Fish Hatchery. Now, 96 years after its primitive beginnings, the Spring Creek NFH releases 15 to 16 million young fall chinook each year, providing a major contribution to the domestic and international Tribal, commercial, and recreational salmon harvest. The hatchery has preserved the genetic stock that might otherwise have been lost due to degraded spawning habitat in the Big and Little White Salmon rivers.

Research and Management

Raising salmon in a hatchery is a science that requires the collaborative efforts of people from many Fish and Wildlife Service (FWS) offices and other agencies. The Lower Columbia River Fish Health Center works closely with the hatcheries to identify fish diseases and recommend treatments. The Abernathy Salmon Technology Center develops new salmon culture techniques, equipment, and feeds; develops techniques to improve the quality of hatchery-reared salmon; conducts genetic research and integrates genetic identification into recovery and restoration of native stocks; and evaluates the effects of various rearing and disease control techniques on the survival of hatchery-reared salmon in the wild. Biologists from the Columbia River Fisheries Program Office and the U.S. Geological Survey's Biological Research Division assist to improve rearing strategies and track salmon migration and survival. In addition to the domestic and international treaties and Tribal trust responsibilities of these mitigation hatcheries, maintaining strong genetic stock, protecting wild salmon, identifying and treating disease, and modifying hatchery rearing practices to produce the most fit fish are the charges of today's fisheries managers.

Managing salmon in the Columbia River Basin goes far beyond fisheries science. Economics, politics, and court actions may ultimately determine the fate of many young salmon. More than 70 Federal, State, Tribal and local agencies, councils, and committees have some influence over Columbia River salmon



Ed Gunderson, fish culturist, checking female tule fall chinook salmon prior to fish spawning at the Spring Creek NFH.

Photo by Judith Maule

Hatchery employees in 1953 were filmed as they killed ripe salmon to remove and fertilize the eggs.

FWS photo



SPOTLIGHT ON HATCHERIES



Scott Zirjacks, a fish culturist at Spring Creek NFH, explains incubation of tule fall chinook to a Chinese visitor.

Photo by Judith Maule

management or their habitat, creating a complex decision-making process. Managers of the FWS Columbia River Gorge hatcheries and fish health center have invested in an active outreach program. They support an information and education office to enhance visibility and improve communication about the role of hatcheries. Increasing contacts in the community through schools and community groups, more frequent communication with the media, and improving communication with state and national legislators are some of the ways hatchery managers are expanding their role in fisheries management.

What does the future hold for salmon and for fisheries managers? There is already an increasing emphasis on studying the genetics of wild salmon and interactions between wild and hatchery-produced fish. Fisheries biologists will continue to expand studies of varying rearing densities, use of experimental diets, simulating natural stream environments in incubation trays and in raceways, and even introducing predators into raceways prior to releasing smolts. Tagging smolts with coded wire tags, a research method introduced in the early 1970's, has helped fisheries managers monitor harvest and identify

improved rearing practices. Newer, more sophisticated tagging methods are providing even more detail about the fish after they leave the hatchery. As habitat restoration efforts increase, hatcheries will provide stocks to reestablish naturally spawning populations.

A Pacific Northwest without salmon is unimaginable. Salmon hatcheries will continue to play an important role to ensure that salmon remain the biological, cultural, and economic resource they have been for thousands of years.

Judith Maule is the Interpretation and Education Coordinator for several national fish hatcheries, a fish health center, and a national wildlife refuge in the Lower Columbia River Gorge. For more information on these facilities, she can be reached at 509/538-2242.

Ed LaMotte, manager of Spring Creek NFH, showing tule fall chinook salmon smolts to school groups.

Photo by Judith Maule



During August and September of 1997, the Fish and Wildlife Service published the following listing actions under the Endangered Species Act:

Proposed Listing Rules

Wenatchee Mountains Checker-mallow (*Sidalcea oregana* var. *calva*) An attractive perennial wildflower in the family Malvaceae, this plant grows to about 5 feet (150 centimeters) in height and produces clusters of pink flowers. As the common name suggests, it inhabits the Wenatchee Mountains of Chelan County in central Washington. The checker-mallow is usually found growing in moist meadows. Alteration of water flows in these meadows, the conversion of habitat to agricultural and residential uses, livestock grazing, fire suppression activities, and competition from native and non-native plants are the primary threats to this plant.



Wenatchee Mountains checker-mallow
Photo by Ted Thomas

Currently, only five populations are known, totaling about 3,300 individuals. The largest site is on private land and Washington Department of Natural Resources property. Two other sites are on private land, and the final two occur on Wenatchee National Forest. Fewer than five individuals are present on each of the Forest Service sites. Because of the plant's restricted range, low numbers, and the threats to its habitat, the Wenatchee Mountains checker-mallow was proposed in the August 1 *Federal Register* for listing as endangered.

Virginia Sneezeweed (*Helenium virginicum*) Despite its unappealing common name, this plant is a wildflower that poses little threat to pollen-sufferers. The

term "sneezeweed" refers to the historical use of the dried leaves to make snuff, inhaled to cause sneezing that would supposedly rid the body of evil spirits. Native Americans also used the plant's sharp-tasting greens to flavor salads.

A perennial member of the aster family (Asteraceae), the Virginia sneezeweed has daisy-like composite flower heads. Its ray flowers are yellow and wedge-shaped, while the central disk flowers form a greenish-yellow, ball-like structure. The plant grows to a height of about 3.5 feet (11 decimeters) from a rosette of basal leaves. As a wetland species, the sneezeweed is found only in wet meadows and on the shores of shallow, seasonally flooded ponds in Virginia's Shenandoah Valley. Its ability to survive the water level fluctuations gives this species a competitive advantage over other plants that might otherwise invade the habitat. Unfortunately, its specific ecological requirements make the species vulnerable to extinction from habitat loss. The filling and ditching of its wetland habitat, other land uses that alter the hydrology, encroaching residential development, and incompatible agricultural practices pose serious threats to the plant's survival. On September 29, the FWS proposed to list the Virginia sneezeweed as threatened.

Biologists have located 25 populations of this wildflower. Five are located within the Jefferson and George Washington National Forests. Most of the others, however, occur on private lands and do not receive protection. The FWS plans to work with land owners to encourage voluntary management practices that maintain good wetland habitat.

Final Listing Rules

Three California Plants Three plant species endemic to the Channel Islands off the coast of southern California were listed on August 8 as endangered:

- Catalina Island mountain-mahogany (*Cercocarpus traskiae*)—a small evergreen tree in the rose family (Rosaceae).
- San Clemente Island woodland-star (*Lithophragma maximum*)—a rhizomatous, perennial herb in the family Saxifragaceae.
- Santa Cruz Island rockcress (*Sibara filifolia*)—an annual herb in the mustard family (Brassicaceae).

The Channel Islands are rich in endemic species as a result of their age and geographic isolation. Unfortunately, many of these plants are imperiled by introduced livestock, competition from non-native plants, fire, and soil erosion.

by Julia Bumbaca

The Internet has many sources for additional information on articles in this edition of the *Bulletin*. Here are a few examples:

National Marine Fisheries Service, Pacific Salmon Information via the Internet

<http://www.nmfs.gov/salmon/salmon.html>

Provides a "partial collection of Pacific salmon related information available via the Internet." Categories include: news and current events, life history, habitat, economic information, state fisheries department connections, Canadian connections, other home pages, and CD-ROMS and videos.

Kemp's Ridley Sea Turtle Recovery Efforts

<http://kingfish.ssp.nmfs.gov/tmcintyr/turtles/kempsec.html>

Information taken from U.S. Fish and Wildlife Service and National Marine Fisheries Service 1992 Recovery Plan for the Kemp's Ridley Sea Turtle.

Bat Conservation International, Inc.

<http://www.batcon.org/index.html>

A "colony of bat information" including species lists, bat facts, bat houses, and conservation projects.

Bat Thematic Unit created by Students of California State University, Hayward's Educational Technology Leadership Graduate Program

<http://www.cccoe.k12.ca.us/bats/>

This is a site built by teachers, for teachers and students. It provides many creative ideas for projects.

HawkWatch International

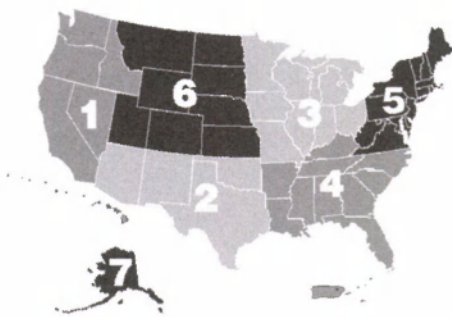
<http://www.info-xpress.com/hawkwatch/>

"Dedicated to monitoring and promoting the conservation of eagles, hawks, and other birds of prey. Striving to increase public awareness, and instill a commitment to protect these magnificent birds and the ecosystems in which they live."

California Department Fish and Game: Habitat Conservation and Management in California

<http://www.dfg.ca.gov/habitats/habacq.html>

Julia Bumbaca is with the FWS Division of Endangered Species in Washington, D.C.



Region 1

Kern Water Bank Habitat Conservation Plan On October 2, 1997, the Fish and Wildlife Service (FWS) issued two "incidental take" permits to the Kern Water Bank Authority under section 10(a)(1)(B) of the Endangered Species Act. These permits, which authorize the take of endangered or threatened species incidental to otherwise legal activities, were made possible by approval of the Kern Water Bank Habitat Conservation Plan (HCP) in Kern County, California. This HCP illustrates how the FWS can help the agricultural community and the State solve California's water problems in a fashion that promotes the conservation of endangered species and their habitat. It provides a way to accomplish both water conservation and environmental objectives.

The primary water conservation objective is the storage of water in aquifers during times of surplus for later recovery during times of shortage. The primary environmental objective is to protect and enhance large portions of habitat in the Kern Water Bank area for threatened and endangered species. In support of these objectives, the HCP is designed to: 1) allow the economical development of water recharge and recovery facilities; 2) preserve compatible upland habitat and other sensitive areas; 3) conserve the 161 species covered under the plan; 4) recreate intermittent wetland/rangeland habitats; 5) provide a conservation bank for third parties; and 6) permit farming.

Salton Sea During the October 1997 annual conference of the Society of Environmental Journalists at the University of Arizona in Tucson, Susan Saul and David Klinger of the Region 1 Public Affairs Office organized a media briefing on issues facing the Salton Sea. Clark Bloom, manager of the Salton Sea National Wildlife Refuge (NWR), and Don Voros, the supervisor for California and Nevada NWRs, conducted the briefing, which was

designed to acquaint visiting journalists from throughout North America with the problems and opportunities at the nearby 380-square-mile inland ocean in southern California. The refuge has been the site of serious bird and fish die-offs in recent years that affected both endangered and non-endangered species.

Their briefing followed the October 3 U.S. House of Representatives hearing on Salton Sea issues before the House Resources Committee's subcommittee on water and power. At the hearing, which was held in Palm Desert, California, Regional Director Mike Spear testified on behalf of the FWS and unveiled a scientific-needs assessment prepared by Richard Zembal of the FWS Carlsbad, California, Field Office, and other FWS biologists. The report seeks to identify research needed to address problems plaguing this damaged ecosystem.

Reported by LaRee Brosseau of the Portland Regional Office.

Region 2

Gila Topminnow (*Poeciliopsis occidentalis*) The tiny Gila (pronounced "hee-la") topminnow is a fish that once flourished in the waters of *iyabulnagoswud* ("Mesquite Round"), a particular spring sacred to the San Carlos Apache people in Arizona. This species was extirpated from the spring in the late 1980's due to diminished flows resulting from excessive vegetation, particularly the tamarisk or salt cedar, a non-native tree now abundant throughout the west. Fortunately, scientists working for the FWS, Arizona Department of Game and Fish, and Arizona State University had the foresight to remove some of the topminnows and place them in temporary "half-way houses" at the Hassayampa (Apache for upside-down) River Preserve and the University.

Planning for the spring restoration effort began in early 1996. Emphasis was placed on removing salt cedar and other introduced plants, promoting native plants, and providing permanent pool habitat for the topminnow. Tribal elders conveyed a simple message: "Keep everything as natural as possible. Do not disturb the mesquites or other native trees—just the rushes and the salt cedar. Also be sure to replace the *Yerba mansa* and other medicinal plants." The need to consider the renovation's potential impacts on two endemic species of snails complicated the plan, especially because neither species attains an adult size much larger than the head of a pin.

Work commenced in June of 1996 with the placement of a series of concrete troughs in the stream course to provide permanent pool habitat, and with structural improvements to an existing fish barrier designed to keep unwanted fish species from entering the spring. Salt cedars were removed from the spring system, and San Carlos Apache youth replaced plants of medicinal importance to the tribe. On August 1, 1996, Gila topminnows were reintroduced to their historic home at Mesquite Round. Four months later, the San Carlos Apache Tribe rededicated the spring to the Apache people and recognized the importance of the Gila topminnow as an indicator of the spring's health.

Subsequent to this project, an additional 1.2 miles (2 kilometers) of historic topminnow stream habitat were restored on the San Carlos Reservation. These projects are considered critical to any future attempts to downlist the Gila topminnow.

Karst Invertebrates What lives underground, has small or absent eyes, elongated appendages, and is predacious? Seven species of these hard-to-find creatures—one ground beetle, two mold beetles, and four arachnids—live only in caves near Austin, Texas, and are collectively referred to as karst invertebrates. Due to their ecological specialization, these animals are especially vulnerable to habitat destruction, fire ant infestation, pollution, and other factors.



Tooth Cave beetle
Photo by Wyman Meinzer

The FWS Austin, Texas, Field Office is involved in several activities related to conservation of listed and petitioned karst invertebrates in central Texas. Currently under way is a study, under contract with the U.S.D.A. Agricultural

Research Service in Gainesville, Florida, to examine the risk posed to rare cave invertebrates by imported fire ants and to evaluate possible treatment methods. The red imported fire ant (*Solenopsis invicta*) is a voracious predator that often nests and forages in the damp, cool cave environment favored by karst invertebrates during the summer months. Fire ants prey directly on the karst invertebrates and other species critical to the underground food chain.

At present, the favored treatment for fire ants near these critical cave environments is boiling water. However, this approach requires large amounts of boiling water, is frequently impractical at caves located in rough, inaccessible terrain, and is often only marginally effective. The U.S.D.A. study should make it easier for land owners and managers to protect important cave resources on their property, and go a long way toward managing one of the major threats to rare cave-dwelling invertebrates.

Desert Pupfish (*Cyprinodon macularius*) In January 1997, personnel from the FWS Parker, Arizona, Fishery Resource Office, Arizona State University and the Upper Gulf of California and Colorado River Delta Biosphere, collected for desert pupfish at sites in northern Sonora and Baja del Norte, Mexico. These collections were made to obtain genetic material to assist in determining if the fish represent the same or distinct populations. The information will be used to implement recovery actions outlined in the Desert Pupfish Recovery Plan.

This effort also prompted discussions to form a binational group to conduct additional studies in northern Sonora and Baja del Norte. Participants in these discussions included the FWS (Ecological Services, Refuges, and Fisheries), the Upper Gulf of California and Colorado River Delta Biosphere Preserve, and the Sonoran Desert Alliance.

Aplomado Falcons (*Falco femoralis septentrionalis*) The summer of 1997 saw 108 northern aplomado falcons released in south Texas by 5 teams of hack site attendants, which were supported by The Peregrine Fund and local FWS refuges. Release area included Laguna Atascosa NWR, with 41 falcons being released from two hack sites; Matagorda Island NWR, with 35 birds being released from two hack sites, and 2 nearby ranches, where 32 falcons were released. Seventy-five of the falcons are known to have survived. The others were taken by predators or have disappeared.

This year's releases essentially double the number of falcons reintroduced into the lower Texas coastal prairie over the past 12 years. As the numbers of falcons increase, new pairs are established, and territories defended, additional sites will be required for continued releases. The FWS and The Peregrine Fund will rely on private lands and partnerships to complete recovery efforts in Texas and other formerly occupied habitat in the U.S. The involvement of private interests is being encouraged by "Safe Harbor" agreements. Such agreements are designed to reduce the concern of land owners that endangered species may be attracted to their property, bringing with them the effects of ESA regulations. A Safe harbor agreement encourages non-Federal land owners to maintain or enhance existing habitats of listed species, restore former habitats of listed species, or otherwise manage their lands in a manner that provides a net benefit to listed species. In return, the FWS provides assurances that future activities would not be subject to ESA restrictions above those restrictions already applicable to the property at the time of the agreement. Several major land owners in south Texas have already signed these agreements.

Reported by Larry A. Dunkeson of the FWS Albuquerque Regional Office.

Region 3

Hine's Emerald Dragonfly (*Somatochlora hineana*) For the first time, presence of the Hine's emerald dragonfly has been documented in Michigan. During a survey this summer, this endangered insect was discovered at six small, limestone/alkaline wetlands in the Upper Peninsula. Previously, this species was only known to exist in Door County, Wisconsin, and wetlands in the Chicago metro area. It has been extirpated from Indiana and Ohio.

Hine's emerald dragonfly lives in calcareous (high in calcium carbonate) wetlands overlaying dolomite bedrock. These types of wetlands are associated with distinct geologic features. The Michigan surveys were conducted in wetlands that are underlain by a geologic formation composed of resistant Silurian limestones and dolomites. Interestingly, last year the lakeside daisy (*Hymenoxys herbaceae*), a threatened plant, was also discovered for the first time in Michigan. It, too, inhabited Upper Peninsula wetlands underlain by the same geologic formation.



Hine's emerald dragonfly

Illustration by Mary Phelan

In addition to sites found in Michigan, the Hine's emerald dragonfly was also found in a new wetland site in Door County, Wisconsin. This site appears to be far enough away from known sites in Door County to be a separate population. The presence of additional sites inhabited by this rare dragonfly improve the potential for recovery.














Kirtland's Warbler (*Dendroica kirtlandii*) The 1997 Kirtland's warbler census was completed in June and 733 singing males were recorded. This is the second-highest number since counts began in 1951. The highest number, 766, was recorded in 1995. Included in the 1997 total are 19 warblers from Michigan's Upper Peninsula. Reproduction of Kirtland's warblers in the Upper Peninsula was first observed in 1995. Since that time, the numbers have steadily increased. Also included in the total are five singing males that were observed in Wisconsin; however, there was no evidence of Kirtland's warblers breeding there.

The Kirtland's warbler census is conducted over a 10-day period each year during the first 2 weeks of June. The 1997 census was a joint effort of Federal and State resource management agencies, the Michigan Department of Military Affairs, the forest products industry, local governments, and conservation groups. The count was conducted by researchers, biologists, and volunteers. Data gathered during the survey provide valuable information on the health of the species and on habitat management.

Reported by Kim Mitchell of the FWS Twin Cities Regional Office

BOX SCORE

Listings and Recovery Plans as of November 30, 1997

GROUP	ENDANGERED		THREATENED		TOTAL LISTINGS	SPECIES W/ PLANS
	U.S.	FOREIGN	U.S.	FOREIGN		
 MAMMALS	57	251	7	16	331	41
 BIRDS	75	178	15	6	274	74
 REPTILES	14	65	19	14	112	30
 AMPHIBIANS	9	8	7	1	25	11
 FISHES	67	11	41	0	119	78
 SNAILS	15	1	7	0	23	19
 CLAMS	56	2	6	0	64	45
 CRUSTACEANS	15	0	3	0	18	7
 INSECTS	24	4	9	0	37	21
 ARACHNIDS	5	0	0	0	5	4
ANIMAL SUBTOTAL	337	520	114	37	1,008	330
 FLOWERING PLANTS	525	1	113	0	639	390
 CONIFERS	2	0	0	2	4	1
 FERNS AND OTHERS	26	0	2	0	28	22
PLANT SUBTOTAL	553	1	115	2	671	413
GRAND TOTAL	890	521	229	39	1,679*	743**

TOTAL U.S. ENDANGERED: 890 (337 animals, 553 plants)

TOTAL U.S. THREATENED: 229 (114 animals, 115 plants)

TOTAL U.S. LISTED: 1119 (451 animals***, 668 plants)

*Separate populations of a species listed both as Endangered and Threatened are tallied once, for the endangered population only. Those species are the argali, chimpanzee, leopard, Stellar sea lion, gray wolf, piping plover, roseate tern, green sea turtle, saltwater crocodile, and olive ridley sea turtle.

For the purposes of the Endangered Species Act, the term "species" can mean a species, subspecies, or distinct vertebrate population. Several entries also represent entire genera or even families.

**There are 477 approved recovery plans. Some recovery plans cover more than one species, and a few species have separate plans covering different parts of their ranges. Recovery plans are drawn up only for listed species that occur in the United States.

***Five animal species have dual status in the U.S.

ENDANGERED
Species
BULLETIN

U.S. Department of the Interior
 Fish and Wildlife Service
 Washington, D.C. 20240

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